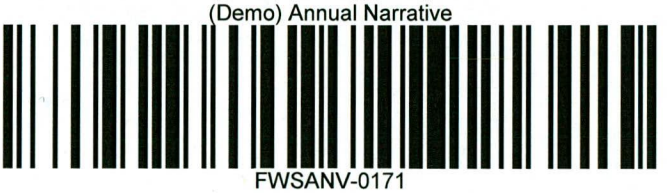
(Demo) Annual Narrative



FWSANV-0171

REPORT OF ACTIVITIES

FISCAL YEAR 1939

MALHEUR MIGRATORY WATERFOWL REFUGE

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United States Department of the Interior
Bureau of Biological Survey
July 12, 1939

Malheur Refuge
Burns, Oregon
July 12, 1939

S - Reports
Annual, F.Y. 1939

AIR MAIL

CHIEF, Bureau of Biological Survey
U. S. Department of the Interior
Washington, D. C.

Dear Sir:

We are transmitting herewith the report of activities for the Malheur Migratory Waterfowl Refuge covering the 1939 fiscal year.

We trust that it meets with your approval.

Very truly yours,

J. C. Scharff
Refuge Manager

fac
Encl.
cc: Regional Director

1939

REPORT OF ACTIVITIES

MALHEUR MIGRATORY WATERFOWL REFUGE

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United States Department of the Interior
Bureau of Biological Survey
Burns, Oregon

REFUGE WILDLIFE POPULATION CONTINUES TO INCREASE

Observations throughout fiscal year 1939 point to the fact that waterfowl are undergoing not a rapid but nevertheless a steady increase on the Refuge, including both nesting and migrant species. During the fall of 1938 it was conservatively estimated that there were a million water birds on the Refuge. The annual duck census in January, 1939, revealed a 400% increase of wintering birds over those of the previous winter. At that time nearly 12,000 birds were observed. These included 4500 Canada geese, 5000 mallards, 700 pintails, 700 baldpates, 400 green-winged teal, 100 ruddy ducks, 60 whistling swan, 50 gadwalls, 50 goldeneyes, 50 lesser scaup and a few redheads, coots, lesser snow geese, mergansers, great blue herons and American egrets.

During the spring migration thousands of birds were in evidence, the larger number of which remained over several days to feed and rest before continuing their northward trek. The larger number of migrants consisted of snow geese, white-fronted geese, pintails and other ducks, cranes, both little brown and sandhill, and numerous species of shore birds.

After the migration peak an increased resident population was apparent. This resident population is made up largely of Canada geese, mallards, pintails, redheads, gadwalls, shovellers, canvasbacks and cinnamon teal, all of which are apparently on the increase. The ruddy ducks seem to be about holding their own while lesser scaup, blue-winged teal and sandhill cranes are more in evidence.

A tremendous increase is apparent in the avocets, black-necked stilts, curlews and other shore birds. Pelicans, cormorants, ibis, gulls and egrets are also registering a larger number than formerly as are many other species, a few of which only use the area in small numbers.

Our two most important fur bearers, muskrats and beaver, also show very definite signs of increase. The muskrats, especially, on the Lake and in the Blitzen Valley have shown an almost amazing increase over the previous year. This will be discussed more thoroughly under the topic of "Scientific Progress".

Upland game birds, especially sage hens and ring-necked pheasants, are showing a steady increase. The European partridge, although observed on the Refuge on numerous occasions, does not seem to be undergoing any apparent increase. Two reports of plumed quail in August and September of 1938 are the only evi-

dence we have of this bird since the severe winter of 1936-1937. These constituted a total of 36 birds seen in the Grain Camp and Krumbo areas. No observation of the Oregon grouse has been reported since the severe winter mentioned above. Mourning doves are quite common throughout the Refuge at this time and they show every evidence of increasing in numbers. Absolute protection and improved breeding conditions are largely responsible for the increased number of this species.

Deer and antelope use the Refuge during the entire year to some extent but the greater number might be classed as an intermittent population. Both mule deer and antelope are showing decided increases in numbers. A winter range problem is facing the Steens Mountain deer herd and, while several years will be required to build up the numbers to a saturation point, provision should be made to harvest the annual increase consistent with the available winter feed.

BOTULISM CAUSES EXTENSIVE FATALITIES

From July 25 to October 7, 1938, we conservatively estimated a loss of 20,000 birds from botulinus poisoning. Some 11,900 birds were handled of which 2,251 were treated in our "duck hospital", the remaining constituting carcasses found dead and buried. Of the birds taken to the hospital 72% recovered.

This epizootic greatly exceeded that of 1937, when but approximately 3,500 birds were lost from this source. The outbreak was at its worst in the northwest portions of Malheur Lake. All the birds were found here with the exception of a small area in the southeast corner. The epidemic seemed aggravated by rainfall in several instances and terminated but a few days after a killing frost on October first.

It is believed that the stage is set again this year for another epizootic, although it is the earnest hope of all concerned that such will not be the case. In any event a close watch is being kept for the first signs of sick or dead birds.

USE MADE OF THE REFUGE

Some 50 nesting rafts were constructed during the early spring months and anchored in ponds of the upper Blitzen Valley. To date many of these rafts have been claimed by muskrats which have built lodges upon them. These in turn have served as excellent nesting sites for Canada geese and numerous Forster's terns, and there are undoubtedly several other species, not observed as yet, which have found them attractive for nest building. Many other birds frequenting the areas in which these rafts are located have been observed upon numerous occasions using them as "loafing" sites. The need for such improvements as these is limited on this Refuge since muskrats provide the same accommodations at no cost or effort as far as man is concerned.

The old hay stacks in Malheur Lake proper still remain the favorite gull and pelican nesting sites. A count of one stack revealed that 171 pelicans, 14 cormorants and over 100 gulls were maintaining nests on this one floating island. Very successful hatches have been recorded.

Owing to the scarcity of cattle and the abundant forage crop of 1938, not to exceed about 40% of the Refuge's feed palatable to livestock was utilized. Timely rains made it possible for sheep to spend the fall on the high desert country and, with few exceptions, the cattle operators had sufficient feed on their private holdings to feed out the season, which reduced the demand to a large degree. However, the indications are this season that the demand is going to be in excess of the supply and all available feed can be satisfactorily utilized.

Approximately $13,089.57 was derived from Refuge permits during the 1939 fiscal year. This amount should steadily increase over the next few years as the permit business becomes more stabilized.

Both fishing and camping have shown an increase over previous years. Fishing over the year was very good with many limit catches reported and individual rainbow trout as long as twenty-six inches. Annual stocking is necessary to maintain this type of angling.

Lake Malheur proper is still being administered by the Court Receiver. Final hearing on this case was held in November of 1938. A decision is expected yet this year, at which time more definite plans can be made for the administration and development of this area. The Receiver has issued permits for the growing of approximately 2000 acres of grain during the 1939 growing season and reports approximately $2100.00 taken in from permits during the 1939 fiscal year. The receivership of this area will undoubtedly prevail for some time in the future as appeals to the rendered decision will unquestionably be made.

PLANTINGS

During the past year a total of 2050 trees was removed from the nursery and planted about the Refuge. The past spring season has been extremely adverse to satisfactory growth of trees and shrubs and it is estimated that in excess of a 60% loss was experienced on all trees and shrubs planted. At the Refuge headquarters many trees that had been established two or three years perished for no apparent reason. From a total of 24 western junipers which were distributed on the hillside near the Refuge headquarters only one live tree remains and it is doubtful if this survives the season.

The P Ranch nursery was closed out and only sufficient trees remain for a limited amount of replacements. Again the meadow mice created a serious problem, particularly during the winter months, and practically all the new seedlings were lost as a result of the work of these rodents.

A successful yield of grain was experienced during the 1938 summer season when 1516 bushels of wheat and 1488 bushels of barley were harvested for seed and feeding purposes. It is estimated that from eight to ten thousand bushels of grain were left standing in the field, which was entirely harvested by the ducks and geese. Approximately 4000 geese wintered on this grain field and ducks and sandhill cranes made continuous use of this field over a period of several weeks.

Additional land was placed in shape for seeding and during the past spring 140 acres of wheat, 100 acres of barley, 20 acres of crested wheat grass, 23 acres of oats, 72 acres of alfalfa and 5 acres of Canada field peas were sown. At the present writing prospects for a bumper crop are excellent. The stand is somewhat uneven in places, which is due to a dry season and the necessity for irrigating to start growth. The stand of crested wheat grass is exceptional and another year it should be able to produce considerable seed. Unfortunately most of the Canada field peas were flooded out but a sufficient acreage remains to observe the possible use as a food crop for birds. Again owing to the adverse season, considerable difficulty was experienced in getting a satisfactory stand of alfalfa but most of the area, we believe, will be satisfactory.

Considerable grain from our 1938 threshing was distributed to other Refuges for seed and feeding purposes and it is hoped that a considerable acreage will be harvested this year for local seed and feeding uses and for use in distribution to other Refuges where required.

The 90-odd acres of land under share-cropping permit to J.H. and Fred Witzel has prospects of producing an exceptional

yield providing early, severe frosts do not occur. The 1938 crop from the Witzel land was extremely short, due to the high water that occurred during June and the latter part of May which made seeding impossible.

Two additional areas of approximately 600 acres are under share-cropping permits in the Blitzen Valley but owing to the adverse season and the lateness with which the grain was ready for seeding a very short crop, if any, will be the result on these areas. However, they will be in excellent shape for 1940 farming and should be highly productive at that time.

PREDATOR CONTROL

It is conservatively estimated that a dozen coyotes were either shot or captured and killed by Refuge personnel during the past year, all incidental to their regular duties.

The hunter assigned to this area by the Division of Predator and Rodent Control has had remarkable success in trapping, shooting, poisoning and denning predators during the past year. Following is a tabulation by month showing the coyotes and wildcats he has accounted for during fiscal year 1939:

Month	Coyotes	Wildcats
July	33	1
August	61	
September	60	1
October	26	1
November	14	2
December	15	
January	9	
February	6	
March	10	
April	23	
May	47	
June	32	1
Total	336	6

No concerted action has been undertaken during the past year toward raven, magpie and crow control on the Refuge. However a continuous war is waged by Refuge personnel against these predaceous birds by shooting and nest destruction and it is undoubtedly having some effect toward keeping their numbers within bounds.

1939 SHOWS EXTENSIVE AND WORTHWHILE DEVELOPMENTS

Our principal accomplishments in the way of water developments are the East Side Canal, extending from the Page Diversion Dam to the Witzel Patrol Station, and Boca Lake.

This canal is designed to carry approximately 250 second-feet of water and the bottom is largely lower than the adjacent lands, which precludes any serious damage by muskrats. A road parallels the entire canal on the bank side which enhances water distribution from this development. Many rubble diversions have been placed in this canal as well as rubble and concrete drops and checks. Some work remains in smoothing up the banks but all in all we can say that this project is completed.

Boca Lake, a water area of approximately 800 acres, gets its supply from this canal. The water empties in at the south end of the Lake and a natural spillway is provided back into the canal about one mile further down. A drain has been provided from the deepest portion of Boca Lake into the Blitzen River, which will allow the removal of all water from the area in the event of an outbreak of botulism or if any further development work needs to be done. This lake will store approximately 3400 acre-feet of water and is an exceptionally fine feeding and resting area.

As many as 80 broods of geese have been counted on this water surface at one time and it would be practically impossible to count the duck broods after they come in from the surrounding areas. Eventually the plans call for an adjacent swamp area which will provide exceptionally fine nesting and about a 400 acre grain field within the distance of a mile, the use of which will provide an outstanding area for resting and nesting waterfowl. The first nesting season in this new water area, showing the many broods of young waterfowl, speak unmistakably for the success of this development.

Essentially all the physical improvements made on the Malheur Refuge during the past year have been done with CCC labor under that allotment. Twenty-eight camp months were expended in this work. Camp Five Mile, BF-1, and Camp Sod House, BF-2, were in operation the entire year and Camp Buena Vista, BF-3, was under our jurisdiction from July 1, 1938, to October 31, 1938, at which time it was transferred to the Division of Grazing.

A total of 79,966 man-days of CCC labor were expended on development projects during the year. A schedule of their accomplishments follows:

PHYSICAL IMPROVEMENTS AT MALHEUR REFUGE

Fiscal Year 1939

Project	Unit	Number Constructed	Number Maintained
Foot Bridges	No.	1	
Vehicle Bridges	No.	19	1
Overnight Cabins	No.	1	
Dwellings	No.		1
Storage Buildings	No.	1	
Other Buildings	No.	11	
Lookout Towers	No.		1
Fences	Rods	16,377	1,050
Levees, Dikes, Jetties	Cu.Yd.	34,029	969
Telephone Lines	Miles	24.4	168
Open Ditches	Lin.Ft.	10,769	
Pipe or Tile Lines	Lin.Ft.	450	
Wells, Inc. Pumps, Etc.	No.	1	
Cattle Guards	No.	1	6
Signs, Markers, Etc.	No.	50	
Tool Boxes	No.	11	
Misc. Structures	No.	6	1
Small Reservoirs	No.	2	
Truck Trails	Miles	11.5	618.2
Limestone Crushing	Tons	1734	
Clearing Channels	Sq.Yd.	168,686	303
Lining of Waterways	Sq.Yd.	303	
Earth Excavation	Cu.Yd.	229,352	
Rock Excavation	Cu.Yd.	38,697	
Rock Riprap	Sq.Yd.	4841	
Water Control Structures	No.	42	2
Nurseries	M-dys	469	83
Fighting Fires	M-dys	19	
Fire Presuppression	M-dys	238	
General Clean-Up	Acres	435.2	
Landscaping	Acres	2.1	3
Moving and Planting Trees	No.	2050	
Razing Undes. Structures	M-dys	2245	
Soil Preparation	Acres	240	
Food & Cover Planting	Acres	304	160
Other Wildlife Activities	M-dys	1303	
Emergency Work	M-dys	394	
Prep. & Trans. Materials	M-dys	5283	
Surveys	M-dys	1689	
Equipment Repair	M-dys	7950	
Warehousing	M-dys	1166	

NESTING STUDIES REVEAL INTERESTING STATISTICS

As observed from the following table our 1939 nesting data is not as yet complete whereas the 1938 data is a summary of records covering the entire 1938 nesting season. Consequently the 1939 picture as depicted throws an over-emphasized weight on early nesting ducks and slights many middle and late nesters. This theoretically will show in all likelihood a slightly higher predation figure than would otherwise be the case if records were now available for the entire 1939 season. In any event accurate comparisons between this year and last regarding nest destruction through predation cannot be possible until evidence is all in for the current season.

Several other factors will also be altered, although possibly to a lesser extent. Consequently, we do not offer this analysis as a complete and accurate comparison but rather as a picture of this work as it has progressed thus far and for what other merits it may have in view of the conditions under which it has been prepared.

It is believed that three factors, namely: average number of eggs per nest, duck nests flooded and geese nests deserted show a significant difference that is not essentially influenced by the above consideration. It is possible that the average clutch is larger this year because of a more equable and an earlier season. The higher percentage of duck nests flooded last year was probably brought about by an unusual run-off of considerable duration, with steadily rising water levels flooding the early nests. This year the flash run-off, which was of short duration, occurred before nesting was in progress. The desertion in geese nests may have been higher in 1938 because of the lack of substantial nesting sites on Malheur Lake, many of such sites consisted merely of windblows of tule stems. This year, however, we have been favored with a large increase of muskrats on the Lake, there probably being 10 muskrat houses for every one there was in 1938. These houses were greatly favored by nesting geese this year and provided excellent sites. Although in a very few instances activities of the rats were responsible for incomplete hatches, flooding and nest desertion, they proved in the aggregate to be of small consequence in comparison to the advantages accruing to the geese in the availability of more substantial nesting sites.

COMPARISON OF WATERFOWL NESTING DATA OF 1938 SEASON (COMPLETE) AND OF 1939 (AS OF JUNE 23, 1939)

Species	Nests by Sample Areas in Units								Total Nests 1939	Total Nests 1938	Total Eggs Laid 1939	Average Eggs Per Nest 1939	Average Eggs Per Nest 1938	Nest Histories Completed 1939	Nest Histories Completed 1938	Complete Hatch 1939	Complete Hatch 1938	Partial Hatch 1939	Partial Hatch 1938	Destroyed By Predators 1939	Destroyed By Predators 1938	Eggs Infertile 1939	Nests Flooded 1939	Nests Flooded 1938	Nests Deserted 1939	Nests Deserted 1938
	1	2	3	4	7	8	10	12																		
Mallard	4	24		69	5	88	1	47	238	135	2152	9.04	9.45	86% 204	128	95 47%	38%	35 17%	30%	60 29%	23%	0	1 .5%	5%	13 6%	6%
Gadwall	4	9		15		21	4	17	70	48	677	9.67	7.75	43% 30	48	9 30%	46%	0 0%	25%	18 60%	23%	0	0	0	3 10%	6%
Cinnamon Teal	3	8		8	1	19	2	23	64	53	600	9.38	7.67	66% 42	52	11 26%	31%	6 14%	12%	24 57%	33%	0	0	4%	1 2%	21%
Pintail	2	3		19		14	4	11	53	28	371	7.00	7.00	60% 32	28	15 47%	32%	3 9%	32%	13 41%	32%	0	0	0	1 3%	4%
Shoveller	3	7		2		13		21	46	10	439	9.54	6.71	63% 29	10	12 41%	30%	4 13%	60%	12 41%	10%	0	0	10%	1 3%	0
Redhead		6		1		8			15	14	166	11.07	8.38	73% 11	14	2 18%	7%	5 46%	29%	2 18%	21%	0	0	7%	2 18%	36%
Canvasback	(Insufficient Samples)					1		3	4	11	39	9.75	9.54	75% 3	11	2 67%	27%	0 0%	55%	1 33%	18%	0	0	0	0	0
Green-winged Teal	1	(Insufficient Samples)					1	1	3	0	28	9.33	0	33% 1	0	0 0%	0%	0 0%	0%	0 0%	0%	0	0	0	1 100%	0
Lesser Scaup	(Insufficient Samples)							1	1	1	6	6.00	0	100% 1	1	0 0%	100%	0 0%	0%	1 100%	0%	0	0	0	0	0
Unidentified Ducks		1		11		4		7	23	24	149	6.48	5.40	91% 21	23	5 24%	4%	2 10%	0%	12 57%	74%	0	0	9%	2 10%	13%
TOTAL DUCKS	17	58	0	125	6	168	12	131	517	324	4627	8.95	8.29	72% 374	315	151 40%	102 32%	55 15%	81 26%	143 38%	91 29%	0	1 .3%	13 4%	24 6%	27 9%
Canada Geese	10	16	35	27	42	32	0	101	263	275	1341	5.10	4.59	100% 263	240	156 59%	54%	60 23%	9%	26 10%	25%	1 .4%	8 3%	4%	12 5%	8%
GRAND TOTAL	27	74	35	152	48	200	12	232	780	599				637	555											

Note: Data on 1939 season are necessarily incomplete since studies are continued until about July 15. The 1938 data cover the entire nesting season

STUDIES IN MUSKRAT AND DEER POPULATION AND DISTRIBUTION

During the winter and early spring months, Refuge personnel conducted studies primarily concerned with muskrat and deer populations. Although both studies were of the extensive type, certain definite trends were revealed which point to the need for further study and to the necessity for taking definite steps along game management lines.

Muskrats were studied especially from the standpoint of lodge density and distribution in Units 6 to 9, inclusive, and on Malheur Lake with the idea in mind of obtaining some idea as to the rats' distribution and relative population and also as preliminary investigational work that a future studies plan might be worked out. This preliminary work was continued in the Buena Vista area and is still in progress, with the idea in mind of ascertaining what disturbing effect if any may be produced by regular inspections of certain lodges. This latter study has not progressed far enough for any statement of conclusions to be made.

The lodge distributional study revealed an increase in the lake houses of approximately 1000% over last year and it has been tentatively estimated that in the entire area studied there are probably in the neighborhood of 6,000 rats present. At the same time, however, our lack of information relative to all the phases of lodge occupancy was brought to the fore. Consequently to obtain even a close estimate of rat population and annual reproduction the necessity was revealed for further study, so that, in the not too far distant future, when trapping becomes a necessity from the standpoint of the protection of Refuge construction from these rodents, surpluses can be handled efficiently with a minimum of guess work. Such studies, it is felt, are keenly justified because of the revenue that can accrue to the Refuge from trapping permits issued on the basis of a scientifically determined surplus crop.

In December and February reconnaissance studies of winter deer range in the western Steens Mountains revealed a very potential problem in range over-population. Even during our last mild winter, current damage to juniper growth was in evidence before deer were allowed access to their higher ranges.

With the present situation of inability to harvest surplus production through normal channels of decimation, together with a declining forage yield because of the abuse of a recently developed over-population, the study revealed the necessity for taking definite steps to bring about the proper balance not only for the sake of a locally valuable forage resource but also to mitigate the ravages of malnutrition in the deer herds themselves during the hard winters that are not infrequent in this area.

BIRD BANDING OPERATIONS

During fiscal year 1939, 6284 birds were banded at the Malheur Refuge. These represented the following species and numbers:

Species	Number
Mallard (Anas platyrhynchos platyrhynchos)	2232
Gadwall (Chaulelasmus streperus)	152
American Pintail (Dafila acuta tzitzihoa)	1974
Shoveller (Spatula clypeata)	83
Baldpate (Mareca americana)	187
Green-winged Teal (Nettion carolinense)	182
Cinnamon Teal (Querquedula cyanoptera)	243
Ruddy Duck (Erismatura jamaicensis)	1
Redhead (Nyroca americana)	181
Canvasback (Nyroca valisneria)	11
Lesser Scaup Duck (Nyroca affinis)	7
Wood Duck (Aix sponsa)	10
White Pelican (Pelecanus erythrorhynchos)	14
Gull (Larus californicus and Larus delawarensis)	586
American Coot (Fulica americana)	271
Black-crowned Night Heron (Nycticorax nycticorax hoactli)	53
Great Blue Heron (Ardea herodias treganzai)	16
Great American Egret (Casmerodius albus egretta)	57
Western Least Bittern (Ixobrychus exilis hesperis)	1
Eared Grebe (Colymbus nigricollis californicus)	2
Pied-billed Grebe (Podilymbus podiceps podiceps)	1
Western Red-tailed Hawk (Buteo borealis calurus)	19
Marsh Hawk (Circus hudsonius)	1
Total	6284

A large number of returns have been received from previous bandings which furnish some very interesting statistics. We have received returns from Alaska, five provinces of Canada, twenty-four states of the United States, twelve states of Mexico and a cinnamon teal was recently reported as being shot on the Magdalena River near Sitionuevo, Magdalena, Colombia.

LAW ENFORCEMENT

As said heretofore the Malheur Refuge is indeed fortunate in its location in regard to centers of population and industrial plants. A limited amount of hunting is done adjacent to the Refuge boundaries but during the past year, even though an adequate patrol was maintained, no violators were apprehended.

The Lake division of the Malheur Refuge presents the major problem of law enforcement during the season since the contention of many riparian owners is that their ownership extends to the Lake center, but so far no one has seen fit to take advantage of their position in this respect which naturally would result in a law enforcement case. Fence cutting and minor trespasses were at a minimum during the past season and we anticipate this form of trespass to practically be unheard of during the next few years.

PUBLIC RELATIONS

Public relations is truly a major activity on the Malheur Refuge and requires considerable time on the part of the Refuge personnel, particularly over week ends, when interested visitors are more free to travel about. While every month during the year is "visiting time" on Malheur, the season of May to November takes care of the peak load.

During May and June of 1939 over one hundred interested visitors were at Malheur. Groups included Governor Sprague and his staff of Salem, Oregon; Ducks Unlimited of California; Dr. Elmo Stevenson with Ornithology class from Eastern Oregon College of Education; and an audubon group of twenty-seven from Portland, Oregon. Individuals representing the Forest Service, Associated Press, Oregonian, Oregon Journal, Washington State Game Commission, Oregon State Game Commission, Oregon State College, Washington State College and California State Game Commission were also present during May and June. Ducks Unlimited had a representative here from the State of Ohio and the Secretary of Agriculture was represented as well as a number of Bureau of Biological Survey employees.

It appears that 1939 will be a banner year for Refuge visitors and every effort is being put forth to sell not only Malheur Refuge but the entire refuge program of the Biological Survey.

WATER CONDITIONS AT MALHEUR REFUGE

The weather station maintained at the Refuge headquarters in cooperation with the U. S. Weather Bureau shows the following precipitation and temperature records for fiscal year 1939:

Month	Precipitation	Max. Temp.	Min. Temp.	Snowfall
July	1.19	96	44	
August	.27	89	36	
September	.43	91	30	
October	1.66	74	22	
November	.87	55	6	1.00"
December	.65	58	0	.50"
January	.43	56	8	4.50"
February	1.24	47	5	15.25"
March	.85	68	9	10.66"
April	.19	82	23	
May	.15	86	28	
June	.20	93	31	

Total Precipitation 8.13"
Max. Temperature 96
Min. Temperature 0
Total Snowfall . . . . . 31.91"

Although precipitation for the months of July to November inclusive for fiscal year 1939 showed a total of 4.42 inches as compared with a total of 2.31 inches for the same period the previous year, the precipitation for the remaining months of the year was far below that of fiscal year 1938, being 3.71 inches as compared with 7.09 inches. The total precipitation during fiscal year 1939 was 8.13 inches and that of the 1938 fiscal year was 9.40 inches. However, this ratio does not reflect the true water conditions at the present time, since the extremely dry spring together with a dearth of snow in the higher elevations has resulted in a marked decrease from July 1, 1938, in available water.

On March 25 and 26 the annual snow measurements were made for the Steens Mountains and Fish Creek snow courses. These measurements showed 29.9 inches of snow with a water content of 12.1 inches at the former course and 60.4 inches of snow with a water content of 22.2 inches at the latter. This represented about a 40% decrease in the snow depth and about a 30% decrease in the water content as compared with a year ago.

The following tabulation of Malheur Lake water level readings present an enlightening picture of water conditions during the past Year:

April 25, 1938	4091.84	November 19, 1938	4092.20
July 14, 1938	4092.70	December 10, 1938	4092.35
August 26, 1938	4092.22	March 24, 1939	4092.89
September 3, 1938	4092.17	March 31, 1939	4092.90
September 10, 1938	4092.13	April 8, 1939	4092.96
September 24, 1938	4091.87	April 14, 1939	4093.00
October 1, 1938	4091.80	April 19, 1939	4093.00
October 8, 1938	4091.89	May 9, 1939	4092.78
October 22, 1938	4091.91	May 21, 1939	4092.66
October 29, 1938	4091.97	June 4, 1939	4092.60
November 5, 1938	4092.05	June 10, 1939	4092.34
November 12, 1938	4092.17	June 24, 1939	4092.18

It may be noted that the Lake reached its maximum height for the 1938 summer season of 4092.70 on July 14 but the maximum height of 4093.00 was reached this spring on April 19. The level as of July 1, 1939, is approximately equal to that of September 1, 1938.

Water recording stations have been installed and are now in operation on the Blitzen River at the Refuge headquarters and at the southern edge of the Refuge. A similar structure has recently been completed on Bridge Creek and is now ready for the installation of the recorder. These stations will give continuous recordings of water flow of the principal streams entering the Blitzen Valley and of the water flow into Malheur Lake proper.